JOURNAL

OF THE

AMERICAN CHEMICAL SOCIETY.

VOL. XIV.—NO. 6.

JUNE,

1892.

COMMITTEE ON PAPERS AND PUBLICATIONS:

A. C. HALE,
J. F. GEISLER,
A. A. BRENEMAN, Editor.

ABSTRACTOR FOR AMERICAN PATENTS:

J. F. GEISLER.

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PUBLISHED MONTHLY.

NEW YORK:
JOHN POLHEMUS PRINTING CO.,
121 Fulton Street.
1892.

1826

The **Journal of the American Chemical Society** appears monthly, except during July and August. It will contain all papers read before the Society, and a list of American Patents relating to Chemical Industries.

The Price of Subscription is $5.00 per year, in advance.

The Meeting Room of the Society is the Law Lecture Room, University Building, Washington Square, New York.

The Regular Monthly Meeting is held on the first Friday of every month, except July and August, at 8 P. M.

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The Committee on Papers and Publications respectfully call attention to the resolutions of the Society, requiring that papers be submitted to the Committee before being read.

Authors will be furnished, gratis, with 20 reprints of each article published in the Journal, *if application for the same be made when the article is sent.*

Members are requested to give notice of any change of address, or failure in the delivery of the Journal. All communications relating to the Journal should be addressed to the Editor.

A. A. BRENEMAN, 97 Water St., New York.

REGULAR MEETING, JUNE 3, 1892.

The meeting was called to order at 8:30 P. M. in the Law Lecture Room of the University. Prof. A. A. Breneman in the chair.

The committee appointed to draw up resolutions in regard to the death of Dr. A. W. von Hofmann reported that they had prepared the following:

"*Whereas*, The American Chemical Society on the 6th of May, 1892, received the melancholy news of the death of its Honorary Member Dr. August Wilhelm von Hofmann, Professor of Chemistry in the University of Berlin, and President of the German Chemical Society, therefore

Resolved, That we deeply deplore the loss of our honored member, one of the most distinguished men of science, whose services to chemistry as an investigator of most difficult problems, as a lucid expounder of the truth, and as a leader in scientific thought, will ever be recalled with gratitude. That in America especially he will long be remembered as an earnest and devoted teacher, and one who endeared himself to pupils of every nationality. That, to the German Chemical Society in particular, we offer our sincere condolence at the loss it has sustained in the removal of its founder, who, by his earnest leadership and wise counsels contributed so largely toward its present great and well deserved prosperity.

(Signed) G. C. CALDWELL,
President.
DURAND WOODMAN,
Recording Secretary.

It was moved and seconded that the report of the committee be adopted, and that the committee be discharged.

It was also ordered that an engrossed copy of the resolution be sent to the German Chemical Society.

The following members were elected:

Dr. J. E. Blomeis, Landing, N. J.

Prof. Walter S. Haines, M. D., Rush Med. Coll., Chicago, Ill.
Dr. Wm. M. Mew, Washington, D. C.
Mr. Wm. H. Seaman, 1424 11th street, Washington, D. C.
Ernest Speidel, B. Sc., 19 Quincy street, Chicago, Ill.
Mr. W. M. Stiles, foot 39th street, Brooklyn, N. Y.
Dr. H. T. Vultè, School of Mines, N. Y.
Dr. Frederic Zinsser, 501 West 58th street, N. Y.

The following nominations were made:

Dr. Henry Carmichael, 12 P. O. Square, Boston, Mass.
Prof. Edward T. Fristoe, Columbian Univ., Washington, D. C.
Prof. N. F. Merrill, Burlington, Vt.
Dr. E. A. de Schweinitz, Cosmos Club, Washington, D. C.
Mr. Geo. Steiger, 1303 F street, Washington, D. C.

A paper on "Observations on American Menthols," by Prof. J. H. Long, of Chicago, was read by title, and announced for publication in the Journal.

The meeting was then adjourned.

DURAND WOODMAN,
Recording Secretary.

THE NEW YORK SECTION.

The regular meeting of the Section was held at the close of the June meeting of the Society. Prof. A. H. Sabin in the chair.

A committee consisting of Dr. H. C. Bolton, Prof. Elwyn Waller and Prof. A. A. Breneman was appointed by the chair to represent the Section in the New York Scientific Alliance, a local association of Scientific Societies.

OBSERVATIONS ON AMERICAN MENTHOL.

By J. H. Long.

As is well known, the menthol from the American oil of peppermint differs much in its physical appearance from that obtained from the English or Japanese oil. The common Japanese menthol appears in commerce in the form of small prismatic crystals, while the American products appear as long, slender needles. This difference is evidently not accidental, depending on the method of distillation and purification followed by the different producers, as it is observed in the products which have been recrystallized by the same person under the same general conditions. A distinct difference in the odor of the two products may also be noted, even after several crystallizations and distillation in vacuo.

The American menthol is produced chiefly from the oil distilled in New York and Michigan, but owing to its relatively high cost is not commonly found in the market at the present time.

A grade of very great purity is produced by the well known distiller of essential oils, Albert M. Todd, Esq., of Nottawa, Mich., to whom I am indebted for samples used in this investigation.

The peculiarities of this menthol were explained in the *American Journal of Pharmacy* for June, 1884, and the name *pipmenthol* then suggested. A fuller description of the product was given by Prof. Henry Trimble in the August, 1884, number of the same journal.

To obtain the menthol from the oil the latter is placed in a vessel with double walls, the space between being packed with a mixture of ice and salt. After a time crystallization takes place, from 20 to 40 per cent. of the menthol present separating out. The solvent oil is then allowed to drain out through a tube leading from the bottom of the inner vessel. By exposure to the air the crystals soon dry and are practically pure, as shown by tests of numerous samples made at different times. From oil very rich in the

camphor crystals separate out at a temperature near 0° C. A specimen secured in this way was dried by simply passing between folds of filter paper when it was found to be nearly pure.

In a preliminary examination of a number of samples obtained from several sources, solutions were made by dissolving 10 grms. of the commercial product in alcohol of 95 per cent. strength and making up to 100 cc. These solutions were polarized in a 300 mm. tube of the large Landolt apparatus with the following result:

No. a_D

1—14.805.
2—14.741.
3—14.745.
4—14.660.
5—14.690.
6—14.760.

Samples 4 and 5 were quite moist. After drying higher results were obtained, each showing

$$a_D = -14.73.$$

From this it appears that the commercial product is nearly constant in composition, if the polarization can be taken as a criterion.

I had at my disposal a large amount of sample No. 6, which was purified as follows:

About 500 grms. was melted and poured into warm water in a beaker on a water bath. The two liquids were repeatedly mixed by stirring and kept at a temperature of 60–70° C half an hour. In this way a slight amount of some insoluble body was separated from the menthol, and collected at the bottom of the beaker. The menthol layer was then poured off and allowed to stand until it crystallized, the crystals being afterwards dried between porous plates in the air. An attempt was made to distil these dried crystals under the ordinary atmospheric pressure, but without perfect success, as a slight decomposition took place. This was indicated by a change of color in the boiling liquid, it becoming yellowish brown, and also by a lowered rotation in the distillate. A solution of 10 grms. made to 100 cc. with alcohol, as before, gave now

$$a_D = -14.°51.$$

However, distilling under reduced pressure gave a much better result. Some specimens were distilled several times under a pressure of 50–100 mm. and when polarized under the same conditions as before gave uniformly $a_D = -14.°820$.

The whole sample was purified in this way and used for a number of experiments chiefly in the line of polarization phenomena.

DENSITY, MELTING POINT AND BOILING POINT.

The density of the solid menthol in compact form was found by weighing in water to be

$$d\,\frac{20}{4} = .890.$$

This is the value given by Moriya (Jour. Chem. Soc. xxxix, 77) for the crystals at 15°.

For the density of the melted menthol I find

$$d\,\frac{44.6}{4} = .8810,$$

which is somewhat higher than the value given by Gladstone and Dale for the Japanese. My own determination for the Japanese is

$$d\,\frac{47}{4} = .878.$$

The melting point of the distilled American menthol I find as 42.°3, while that of the single Japanese sample was a trifle higher, viz: 42°.6. These are somewhat higher than the values usually given, which were probably obtained from the undistilled product. With crystals dried in the air or between paper I find lower values. Moriya (loc. cit.) gives 39°, Atkinson & Yoshida (Jour. Chem. Soc. xli, 50) give low values for the air dried crystals, but find 42.°2 as the melting point of a sample purified by distillation. The boiling point of the distilled American menthol I find to be 212.°5 (corr.) with Bar. = 742. The values given by various observers for the Japanese range between 210° and 213°.

SPECIFIC ROTATION.

I find nothing in the literature on the specific rotation of the liquid (melted) menthol. Some results are found for the Japanese

menthol based on an examination of alcoholic solutions, but the date seems to be, in several instances, inaccurate. The value given by Oppenheim (Jour. Chem. Soc. xv, 26) is

$$[a]_D = -59.°6,$$

deduced from a 10 per cent. solution in alcohol. Moriya (loc. cit.) gives

$$[a]_j = -59.°3$$

which corresponds approximately to

$$[a]_D = -49.°4$$

for a 10 per cent. solution.

For a 10 per cent. alcoholic solution, Arth (Ann. de Chim. et de Phys. [6], vii, 438) gives

$$[a]_D = -50.°1,$$

while for one of 5 per cent. he gives

$$[a]_D = -49.°4.$$

I have made a direct determination of the rotation in a sample of the melted American menthol. A 200 mm. jacketed tube was employed and a temperature of 46° was maintained during the time of the experiment by means of a current of warm water. This temperature is high enough to keep the substance in a state of perfect fluidity, and is the temperature at which the specific gravity was found.

The mean of a number of closely agreeing readings was

$$a_D = -87.°716,$$

and this gives, after introducing a slight correction for length of tube at the higher temperature,

$$[a]_D = -49.°86.$$

To determine how this value agrees with those deduced from the rotation of solutions was the object of a lengthy series of experiments, the main details of which are here given. Solutions were made in alcohol, benzene and glacial acetic acid, the menthol used being all taken from the same distilled sample.

SOLUTIONS IN ALCOHOL.

For these tests a pure redistilled alcohol of approximately 95 vol. per cent. was used. This was taken in preference to absolute alcohol where change of strength by exposure to air is unavoidable.

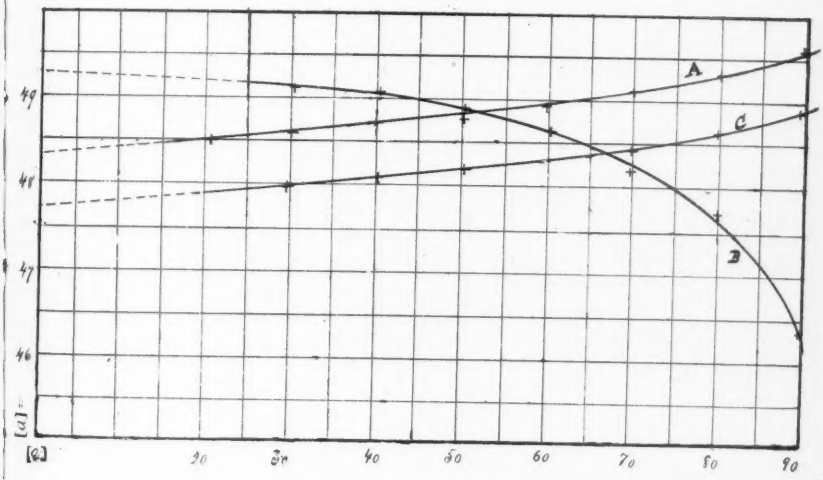
The actual strength of the alcohol employed in all the tests is given by the specific gravity,

$$d\,\frac{20}{4} = .81441.$$

Eight solutions were made with approximately 10, 20, 30, 40, 50, 60, 70 and 80 per cent. of menthol, all weights being reduced to vacuo. A portion of each solution was used for a specific gravity determination in a small pyknometer, brought always to a temperature of 20° in a vessel of water. This temperature was maintained with an error of less than 0.°1 in all the experiments. The remainder of each solution was used for polarization in a 300 mm. tube, kept at 20° by a current of water.

The variation of the length of the tube from 300 is inappreciable, and can be neglected.

The results of the experiments are shown in tabular form, as follows:



No.	Per Cent. of Menthol.	Per Cent. of Alcohol.	Sp. Gr. of Solution.	Observed Rotation, a.
1	10.1228	89.8772	.82271	— 12.°385
2	20.0126	79.9874	.83010	— 24.°585
3	30.0904	69.9096	.83845	— 37.°186
4	40.3447	59.6553	.84732	— 50.°218
5	49.8839	50.1161	.85560	— 62.°540
6	60.0664	39.9336	.86391	— 75.°856
7	69.9443	30.0557	.87401	— 89.°141
8	78.9552	21.0448	.88283	— 101.°398

From the observed values of the above table the specific rotations given below were calculated according to the usual formula.

$$[a] = \frac{10^4\ a}{l\ c} = \frac{10^4\ a}{l\ p\ d}$$

Where a is the observed angle of rotation, l the length of tube in millimeters, c the concentration, or grms. in 100 cc. of solution, p the percentage strength of the solution and d its density.

The values of [a] are not quite constant, but vary slightly with the concentration, decreasing as the latter increases. In other words [a] increases with q, expressing by this the percentage amount of the inactive solvent present.

By plotting the values of the specific rotation as ordinates with the amounts of solvent as abscissas we get a curve nearly straight at first but finally slightly concave upward, as shown below in the figure at A.

The deviation from a straight line is so little, however, that the values of [a] can be very well expressed by the simple interpolation formula:

$$[a] = A + Bq. + Cq^2.$$

From solutions 4, 6 and 8 I find

$$[a] = 48.216 + .013237\ q. - .00001041\ q^2.$$

From 6, 7 and 8,

$$[a] = 48.191 + .014974\ q. - .00003886\ q^2.$$

From 3, 6 and 8,

$$[a] = 48.239 + .011510\ q. + 00001795\ q^2.$$

From 2, 5 and 8,

$$[a] = 48.312 + .006840\ q. + .00007501\ q^2.$$

The mean of the last three is,

$$[a] = 48.247 + .011108\ q. + .00001870\ q^2.$$

I employed this last equation in the calculation of the values given in the table below, under: "[a] cal."

No.	pd. = c.	[a] obs.	[a] cal.	diff.
1	8.3281	49.°571	49.°396	— .175
2	16.6124	49.°330	49.°255	— .075
3	25.2293	49.°131	49.°115	— .016
4	34.1848	48.°968	48.°976	+ .008
5	42.6807	48.°843	48.°851	+ .008
6	51.8920	48.°727	48.°720	— .007
7	61.1320	48.°606	48.°598	— .008
8	69.7040	48.°489	48.°488	— .001

The calculated and observed values agree very closely except for the two most dilute solutions, where the specific rotations by observation is higher.

In Arth's experiments, referred to above, the strength of the alcohol is not given, nor is the density of his solutions, but it is evident that the value for the 10 per cent. solution is too high. This value is inconsistent when taken in connection with that of the 5 per cent. solution.

From the above observations it is seen that the specific rotation of the pure substance, as deduced from tests of solutions, must be about 48.°25 at 20°. In order to compare this value with that obtained by observations on the melted menthol I polarized solutions at higher temperatures. One such solution contained 17.37 per cent. of menthol and had the specific gravity:

$$d\ \tfrac{4.6}{4} = .798.$$

In the 200 mm. tube it gave a = — 21.°05, from which

$$[a] = — 50.°62.$$

That is, the specific rotation increases with the temperature. Assuming that the increase is approximately the same for all concentrations the specific rotation deduced from strong solutions at

this temperature should be about — 49.°5. This agrees satisfactorily with the observed value — 49.°89.

SOLUTIONS IN BENZENE.

Several tests were made with pure recrystallized benzene as a menstruum, in which the menthol is very readily soluble. The chief results of these experiments are given in this table:

No.	Per Cent. of Menthol.	Per Cent. of Benzene.	Sp. Gr. of Solution.	Observed Rotation, a.
9	10.0326	89.9674	.88016	— 12.°282
10	20.0163	79.9837	.88131	— 25.°265
11	30.4313	69.5657	.88276	— 38.°928
12	39.8777	60.1223	.88435	— 51.°437
13	49.3899	50.6101	.88575	— 64.°206
14	59.8799	40.1201	.88778	— 78.°300
15	69.6514	30.3486	.89025	— 91.°510

Calculating the specific rotations from the above observations and plotting them as functions of the dilution, q, we obtain a curve which deviates greatly from a straight line. The deviation at the points corresponding to weak solutions is so great that a simple interpolation formula will not satisfy the whole curve.

For the stronger solutions this equation gives results which can be used:

$$[a] = 49.°511 - .025634\ q. + .0008403\ q^2. - .00001102\ q^3.$$

Nearly the same constant is given by the equation:

$$[a] = 49.°495 - \frac{28.614\ q.}{2836.8 + q.}$$

The true specific rotation of the menthol as found from the benzene solutions appears, therefore, to be higher than that found from the solutions in alcohol. The specific rotation of the melted menthol lies between that deduced from the benzene and alcohol solutions.

Owing to the greater volatility of the benzene it is probable that the rotations observed are a trifle high because of a slight loss of the menstruum by evaporation, even when great care was taken in the manipulation.

The values of the specific rotation are given in the following table, while the plotted curve, showing variations in some, is given at B in the figure.

No.	pd. = c.	[a] obs.	[a] cal.	diff.
9	8.8303	46.°366		
10	17.6405	47.°741		
11	26.8662	48.°299	48.°085	— .214
12	35.2658	48.°619	48.°613	— .006
13	43.7472	48.°922	48.°940	+ .018
14	53.1602	49.°097	49.°125	+ .028
15	62.0071	49.°193	49.°199	+ .006

SOLUTIONS IN ACETIC ACID.

A third series of experiments was carried out, using pure recrystallized acetic acid as the solvent.

The solutions were made in all cases without the application of heat and were not allowed to go above 22°. The table below gives the results of the individual tests:

No.	Per Cent. of Menthol.	Per Cent. of Acid.	Sp. Gr. of Solution.	Observed Rotation, a.
16	10.2488	89.7512	1.03099	— 15.°482
17	20.1108	79.8892	1.01298	— 29.°744
18	30.1956	69.8044	.99615	— 43.°739
19	40.4986	59.5014	.98010	— 57.°559
20	49.5124	50.4876	.96606	— 69.°201
21	59.8591	40.1409	.95161	— 82.°164
22	70.0220	29.9780	.93757	— 94.°454

The results of the calculated specific rotations, when plotted as before, give a very regular curve resembling that found from the alcohol solution. This curve is shown at C in the figure.

The points on this curve are given by equations as follows:
From 20, 21 and 22,

$$[a] = 47.663 + .007638\ q. + .00006929\ q^2.$$

From 17, 20 and 22,

$$[a] = 47.615 + .010226\ q. + .00003712\ q^2.$$

From 16, 18 and 21,

$$[a] = 47.856 + .001293\ q. + + .00010784\ q^2.$$

The mean of these gives,

$$[a] = 47.711 + .006386\ q. + .00007142\ q^2.$$

from which the calculated specific rotations in the table below were found. These agree very well with the results of direct experiment:

No.	pd. = c.	[a] obs.	[a] cal.	diff.
16	10.5665	48.°840	48.°859	+ .019
17	20.3718	48.°668	48.°676	+ .008
18	30.0792	48.°471	48.°505	+ .034
19	39.6928	48.°338	48.°343	+ .005
20	47.8320	48.°225	48.°215	— .010
21	56.9625	48.°081	48.°082	+ .001
22	65.6506	47.°954	47.°966	+ .012

It is apparent that acetic acid is not a good menstruum in this case, although the values given are very regular. The specific rotation in the concentrated solutions falls below that observed with the liquid menthol. At high temperatures menthol and acetic acid act on each other with production of acetate, and it is possible that some of the same product is formed at a temperature of 20° even.

But Oppenheim has shown (loc. cit.) that the acetate has a much higher specific rotation than the original menthol, which result I have confirmed by recent experiments. However, with the ether formed at the ordinary temperature I should have found a higher rather than a lower specific rotation with the solutions experimented on. An observation having some bearing on the question was made during the tests in this manner. Several solu-

tions, first polarized immediately after preparation, were kept ten days in well stoppered bottles and polarized again. In the second test a higher result was always found, which would correspond to the behavior of ether produced in the interval.

Apparently, the first effect of the acid with the menthol is to produce a combination characterized by slightly lower specific rotation, which later gives place to the ether with higher than normal rotation.

Several experiments were tried with a single sample of Japanese menthol dissolved in alcohol and acetic acid. The results found were slightly higher than those obtained from any one of the American samples. This Japanese product was clean and dry and apparently a pure commercial specimen. I redistilled it under low pressure and used this product for the test.

In the 300 mm. tube it gave,

$$a = -14.^{\circ}840$$

for a solution containing exactly 10 grms. in 100 cc., the same alcohol employed in the other test being used here.

The purified American sample gave under the same conditions,

$$a = -14.^{\circ}820.$$

The slight differences in physical properties between the two varieties of menthol are not important enough to point to a difference in chemical structure. It is possible that they may be due to the presence of traces of associated products in the original oil which cannot be perfectly separated by the simple methods employed in purification. It appears from the investigations of Beckett and Wright (Jour. Chem. Soc., XXIX., 1) and Trimble (loc. cit.) that the oil of peppermint contains, besides menthol, another oxidized product in small amount, probably menthone. This is a body with high boiling point, only slightly lower than that of menthol and + rotation. A trace of it could easily remain with the menthol and exert an appreciable influence on the specific rotation, sufficient, probably, to account for the trifling differences noted above.

CHICAGO, May, 1892.

Abstracts of American Patents Relating to Chemistry.

(From the U. S. Patent Office Gazette.)

Issued June 7, 1892.

476,247.—Food steamer. Thomas Cassaden, Jr., Waterloo, Iowa.

476,256.—Method of and apparatus for extracting aluminium. Michael Emme, Atlanta, Ga.

476,260.—Gas or steam generator. Jacob M. Goldsmith, Chicago, Ill.

476,261.—Gas generator. Jacob M. Goldsmith, Chicago, Ill.

476,264.—Magnesium light composition. Eugen Hackh, Stuttgart, Ger.

476,274.—Apparatus for purifying, moistening and attemperating air. Louis C. Huck, Chicago, Ill.

476,276.—Disinfectant. Henry Jackson, Chicago, Ill.

Consists of slaked lime, sulphate of iron, crude carbolic acid, caustic soda, sodium chloride.

476,286.—Apparatus for skein dyeing. Alvin S. Lyon, Lowell, Mass.

476,320.—Paste making machine. Francis H. Shepherd, Davenport, Iowa.

476,335.—Violet azo dye. Moritz Ulrich, Elberfeld, Ger.

476,336.—Black azo dye. Moritz Ulrich, Elberfeld, Ger.

476,337.—Blue dye. Moritz Ulrich, Elberfeld, Ger.

476,371.—Tetrazo blue dye. Carl Dinsberg, Elberfeld, Ger.

476,372.—Thermostatic governor and moter. William E. Eastman, Boston, Mass.

476,374.—Recording thermometer. William E. Eastman, Boston, Mass.

476,393.—Dyestuff. Richard Lauch, Elberfeld, Ger.

Process for producing a dyestuff by combining "molecular proportions of tetrazo-diphenyl, salicylic acid, and alpha-naphthylamine, sulphonating the product thus obtained, diazotizing and further combining it with one molecular proportion of the sodium salt of alpha-naphthol-alpha-monosulphonic acid."

A greenish black amorphous powder, readily sol. in water with deep gray black color, in soda lye with red, and in concentrated sulphuric acid with intensely blue-red color, which latter turns greenish blue on addition of a large quantity of water. It dyes unmordanted cotton in neutral or alkaline baths a greenish black or dark gray of high fastness and intensity.

476,413.—Triphenylmethane dye. Friederich Runkel, Elberfeld, Ger.

476,414.—Triphenylmethane dye. Friederich Runkel, Elberfeld, Ger.

476,418.—Alizarine derivative. Robert E. Schmidt, Elberfeld, Ger.

Alizarine bordeaux is oxidized with manganese in concentrated sulphuric acid solution and the resulting diquinone then combined with salicylic acid in sulphuric acid solution. A greenish black amorphous mass with metallic luster, almost insol. in cold and hot water, sol. in sod. carbonate with reddish blue color and very soluble in soda lye with greenish blue color, in ammonia with pure blue color in conc. sulphuric acid with greenish blue color from which solution water precipitates yellowish brown flakes. It dyes wool mordanted with chromium salts in greenish blue shade.

476,419.—Alizarine dye. Robert E. Schmidt, Elberfeld, Ger.

A new dyestuff produced by the action of ammonia upon the anthradiquinone formed when alizarine bordeaux is oxidized in sulphuric acid solution with manganese at low temperatures.

It is almost insol. in water, but soluble in solutions of sod. carbonate with reddish violet, in soda lye with indigo blue color, in ammonia liquid with bluish violet color, by conc. sulphuric acid with dark violet color which turns at first into red and then into reddish brown when diluted with water.

476,420.—Alizarine derivative. Robert E. Schmidt, Elberfeld, Ger.

Alizarine bordeaux is treated with ammonia and subsequently precipitated with acids. A dark violet crystalline compound with greenish reflex, insol. in water, soluble in soda lye with bright blue color, in concentrated sulphuric acid with red color and cinnabar-red fluorescence separating on the addition of water in yellowish brown flakes. The sulphuric acid solution shows distinct and clear bands of absorption in the spectroscope. It dyes wool mordanted with chromium salts a blue color.

476,441.—Centrifugal apparatus for cooling or heating liquids. Carl G. Bjorlin, Stockholm, Sweden.

476,447.—Apparatus for making ultramarine blue. Johann Büttel, Newark, N. J.

476,483.—Secondary battery plate. Edward C. Paramore, Philadelphia, Pa.

476,491.—Alizarine dye. Robert E. Schmidt, Elberfeld, Ger.

Alizarine bordeaux in sulphuric acid solution is oxidized with manganese and the resulting anthradiquinone treated with salicylic and subsequently with ammonia.

An olive colored powder with metallic luster, sparingly sol. in water, easily soluble in sod. carbonate with blue color, in soda lye with greenish blue and in ammonia, glacial acetic acid, or alcohol with reddish blue color, in conc. sulphuric acid with reddish violet color, from which solution water precipitates reddish brown flakes. Wool mordanted with chromium salts is dyed a clear bluish green.

476,497.—Amalgamator. Alva M. Stetson, Oakland, Cal.

476,500.—Concentrator. James Tulloch, Angels Camp, Cal.

476,542.—Artificial stone. Johann H. Kleb, Newark, N. J.

476,548.—Depurator. John Nixon, Farmland, Ind.

476,554.—Apparatus for converting petroleum, etc., into gas and burning the same. George F. Randolph, Little Genesee, N. Y.

476,555.—Manufacture of soap with whey. Albert W. Rehnström, Mülhammar, Sweden.

476,556.—Manufacture of soap. Albert W. Rehnström, Mülhammar, Sweden.

476,557.—Soap. Albert W. Rehnström, Mülhámmar, Sweden.

476,560.—Apparatus for burning petroleum oils, etc. Oswald R. Ruth, Jersey City, N. J.

476,574.—Lubricant. Wilson H. Strickler, Dodge City, Kan.

476,580.—Apparatus for dyeing. George M. Undy, Philadelphia, Pa.

476,592.—Process of making borax. Jesse Ascough, Handsworth, Eng. A process for granulating borax.

476,599.—Process of and apparatus for the manufacture of alimentary products from corn. Hervey Bates, J. Indianapolis, Ind.

476,611.—Steam generator. James Cunningham, Dushore, Pa.

476,645.—Method of and apparatus for aerating beverages. William Hucks, London, Eng.

476,651.—Apparatus for galvanizing wrought or cast iron and steel. Thomas Jones, Netherton, Eng.

476,671.—Beer filter. Johan Moeller, Boston, Mass.

476,672.—Glass furnace. Michael E. Murphy, Coraopolis, Pa.

476,701.—Evaporating pan. Harrison F. Thurston, Centre Bartlett, N. H.

476,709.—Carburetor and purifier. George W. Weaver, Greensburg, Pa.

476,733.—Galvanic battery. Martin M. Clark, Chicago, Ill.

476,737.—Filter. William M. Deutsch, Elizabeth, N. J.

Issued June 14, 1892.

476,775.—Hot air furnace. Henry D. Babcock, Leonardsville, N. Y.

476,788.—Composition for cleaning wall paper and for other purposes. James E. Devine, Baltimore, Md.

A composition consisting of flour, sodium chloride, powdered naphthaline and coloring matter.

476,789.—Furnace for smelting zinc ores. Selwyn C. Edgar, St. Louis, Mo.

476,832.—Apparatus for making ice. Thomas Shipley, Cincinnati, Ohio.

476,837.—Evaporator. Elias Stillwell, Dadeville, Mo.

476,877.—Hot air furnace. Jacob Fridley, Carlisle, Pa.

476,891.—Process of and apparatus for evaporating sugar solutions. James A. Morrell, New Orleans, La.

476,896.—Soldering metal for aluminium. Alexis Rädes, Christiana, Norway.

An alloy of zinc, cadmium and tin.

476,913.—Process of manufacturing an alloy of iron or steel and nickel. Ezra F. Wood, Munhall, Pittsburgh, Pa.

A layer of limestone is charged into a basic furnace, "superimposing a layer of bricks composed of nickel oxide and carbonaceous material, then charging in pig iron and heating the charge, thereby causing reduction of the oxide and decarburization of the iron and producing an alloy of nickel and steel."

476,914.—Process of and apparatus for the extraction of aluminium. Myrthil Bernard and Ernest Bernard, Paris, France.

An electrolytic process. Cryolite and sodium chloride are melted together "in such proportions as to form a bath which is specifically lighter than aluminium and then passing the main portion of an electric current through the bath between an anode and a cathode to the exclusion of the containing vessel and the remaining fraction of the current through the bath between the anode and the containing vessel as a fractional cathode, whereby pure aluminium is liberated at the cathode and aluminium alloy is formed upon the containing vessel."

476,917.—Confectioners' kettle. Thomas Burkhard, Brooklyn, N. Y.

476,930.—Distilling and rectifying apparatus. Jean Schafhaus, New York, N. Y.

476,934.—Fluid meter. Emanuel Spin. Kruman, Austria-Hungary.

476,955.—Amalgamator. William J. Gard, Samuel S. Dalzell and William A. Shafer, Moab, Utah.

476,979.—Centrifugal apparatus. Charles L. Cairns, Jersey City, N. J.

476,983.—Pyromagnetic generator. Thomas A. Edison, Llewellyn Park, N. J.

476,991.—Method of and apparatus for separating ores. Thomas A. Edison, Llewellyn Park, N. J.

477,023.—Apparatus for melting tallow, wax, etc. August Seiffert, Frankenstein, Ger.

477,026.—Apparatus for treating ores. William H. B. Stout, Chicago, Ill.

477,061.—Apparatus for purifying oil. Emil Noppel, Philadelphia, Pa.

477,063.—Churn. Daniel H. Parker, Pleasantville, Pa.

477,072.—Measuring funnel. Thomas F. Scollay, Memphis, Tenn.

477,089.—Process of purifying ammonia. Hans von Strombeck, New York, N. Y.

The crude ammonia gas is exposed to the action of metallic sodium, the gas purified, separated from the impurities and finally liquified.

477,111.—Concentrator. George Gates, Jackson, Cal.

477,121.—Automatic temperature regulating system. Warren S. Johnson, Milwaukee, Wis.

477,138.—Process of extinguishing fire. Hiram S. Millis, Detroit, Tex.

477,143.—Oven thermometer. Harvey Murdock, Brooklyn, N. Y.

477,153.—Distillation of hydrocarbon or other oils. Carl M. Pielsticker, London, Eng.

477,182.—Secondary battery. Henry H. Lloyd, Philadelphia, Pa.

Issued June 21, 1892.

477,208.—Beer filter. Heinrich C. J. Gehake, Berlin, Ger.

477,213.—Filter. Omor H. Jewell, Chicago, Ill.

477,220.—Process of recovering tin from scrap. John J. Naef, Paterson, N. J.

The process consists in "suspending the scraps in a stannic salt solution containing lead plates, and then passing an electric current from the tin scraps to the lead plates, whereby the tin will be dissolved from the scraps and precipitated on the lead plates."

477,231.—Apparatus for casting metals. John J. C. Smith and Victor E. Smith, Passaic, N. J.

477,238.—Filter. Claes E. Winterros, Brooklyn, N.Y.

477,247.—Rheostat. George K. Cummings, Chicago, Ill.

477,281.—Apparatus for purifying oil. Ole K. Thomasen, Christiana, Norway.

477,286.—Retort furnace. John A. Yeadon and William Adgie, Leeds, Eng.

477,313.—Heat indicator. Frederick W. Sears.

477,326.—Method of manufacturing artificial granite and marble. Charles George, Berlin, Ger.

Finely ground silicates are mixed with argilliferous sand, and in special cases with fragments of marble, the mixture melted in a furnace and the bath then mixed with a similar one prepared separately in the same manner and kept in tough state and colored by the addition of metallic oxides, and then casting the resulting mixture in molds.

477,348.—Process of recovering tin from scraps and waste tin plate. Camille L. C. Berton, Paris, France.

The process consists in placing the scraps or waste in a bath of a temperature of about 50° C. composed of hydrochloric acid containing 6 per cent. of its weight of a nitrate, then adding more of the scraps or waste in successive charges, and in the meantime gradually raising the temperature of the bath to a point not exceeding 90° C. as it becomes more and more saturated with tin and weaker in the nitrate.

477,350.—Process of electroplating with alloys. Edward T. Burrows, Portland, Me.

Wire netting is placed in a solution containing sulphite of copper, caustic potash, zinc sulphate, chloride of tin, sal. ammoniac and muriate of iron and passing a current to it from an anode of copper, tin and zinc.

477,354.—Process of and apparatus for generating fuel gas. John W. Culmer, New Brighton, Pa.

477,357.—Incrustation preventive. John B. Dodds, Newcastle-on-Tyne, and John R. Fothergill, West Hartlepool, Eng.

A solution of an alkaline zincate is introduced into the boiler.

477,364.—Brick kiln. James Henry, Cloverport, Ky.

477,375.—Process of making nitric acid. Julius Lang, Griesheim, Ger.

477,381.—Air compressor. Arthur O'Brien, Helena, Mont.

477,418.—Brick kiln. Michael J. Hynes, Toronto, Canada.

477,442.—Evaporator. George M. Newhall and Teile H. Müller, Philadelphia, Pa.

477,471.—Condenser. Edward Theisen. Sinzig-on-the-Rhine, Ger.

477,486.—Photographic developer. Morume Andresen. Berlin, Ger.

The sensitive plates are treated with paramido-phenol or a derivative thereof.

477,519.—Hot air furnace. James Cunningham, Dushore, Pa.

477,527.—Apparatus for vaporizing acids in the manufacture of white lead. Edward V. Gardner, London, Eng.

477,568.—Method of producing ornamental enamel designs. Frederick B. Nichols and Abbie T. Crane, New York, N. Y.

477,615.—Water purifier and boiler cleaner. William V. Walker, Moravia, N. Y.

477,623.—Metallurgical furnace. Michael R. Conley, Brooklyn, N. Y.

477,624.—Atomizer for liquid fuel. Stephen Cox, Jr., Bridgeton, N. J.

Issued June 28, 1892.

477,632.—Composition of matter for bricks. Ambrose S. Baker, Sandy Creek, N. Y.

A composition of gravel and sand, Portland cement, pulverized iron ore, salt and graphite.

477,645.—Battery. William A. Childs, Englewood, N. J.

477,647.—Non-conducting covering for steam pipes, etc. Benjamin J. Christie, Leadville, Colo.

477,670.—Process of refining raw sugar. Franz O. Matthiessen, Irvington, N. Y.

477,722.—Color grinding machine. Hermann J. Weckauf, Rheydt, Germany.

477,725.—Apparatus for making gas. Joseph Williams, Jr., and Erasmus O. Peoples, Allegheny, Pa.

477,727.—Filtering apparatus. David Williamson, New York, N. Y.

477,735.—Process of making white pigments. John Blair, Spokane, Wash.

477,755.—Boiling and precipitating tower. Gustav S. Hanisch, Benthen, Germany.

477,759.—Fire indicator. Malvern W. Iles, Denver, Colo.

477,792.—Furnace for alloying metals. William A. Baldwin, New York, N. Y.

477,794.—Machine for breaking and cleaning hemp. Joseph Breslin, Newport, Ky.

477,812.—Sectional surface condenser. Elihu Nelson, New York, N. Y.

477,813.—Sectional surface condenser. Elihu Nelson, New York, N. Y.

477,814.—Feed water heater and condenser. Elihu Nelson, New York, N. Y.

477,815.—Feed water heater and condenser. Elihu Nelson, New York, N. Y.

477,816.—Sectional feed water heater. Elihu Nelson, New York, N. Y.

477,823.—Method of preparing malt for brewing. Ernst Richter and Adam Schaefer, New York, N. Y.

477,834.—Gas retort. André Coze, Rheims, France.

477,844.—Preservation of meat. William Laubheimer and Henry Salzer, Baltimore, Md.

"The process of preserving meat by successive steps of steaming, cooling, compressing while cold, enveloping in a shell of fabric and plaster of paris, and when the latter has hardened placing in a can, with the natural fat of the meat surrounding the package, heating and sealing the can."

477,847.—Manufacture of artificial stone. Wilhelm Reissig, Munich, Germany.

477,850.—Art of preserving meat. Henry Salzer, Baltimore, Md.

"Improvement consisting in surrounding a piece of meat in a shell composed of fabric and plaster of paris, heating in a bath of animal fat, wrapping it in a pliable material impermeable to air and water, and finally subjecting a second time to a sterilizing heat."

477,856.—Fruit evaporator. Joseph W. Doty, Lockport, N. Y.

477,859.—Spraying device for cooling beer, etc. Clarence C. Hanford, Medford, Mass.

477,872.—Hydrocarbon oil vaporizer and burner. Henry P. Roberts, Jamestown, N. Y.

477,875.—Method for arresting and extinguishing combustion in charcoal kilns. Albert Vickers, Baltimore, Md.

477,893.—Apparatus for cooling water. Henry B. Ford, Philadelphia, Pa.

477,909.—Process of and apparatus for dampening grain preparatory to grinding. Bert Meier and Louis E. Fritsche, Minneapolis, Minn.

477,910.—Gas meter. William N. Milsted, New York, N. Y.

477,914.—Secondary battery. William L. Silvey, Lima, Ohio.

477,934.—Ore concentrator. Horatio F. Hicks, Ashland, Ore.

477,936.—Ore concentrator. Edgar A. Hockley, Ouray, Colo.

477,990.—Manufacture of stained glass for windows, etc. Arthur R. Carter and Henry C. Hughes, London, Eng.

477,993.—Brick kiln. Joseph Conley and James M. Wolfe, Tarkio, Mo.

477,994.—Brick kiln. Joseph Conley and James M. Wolfe, Tarkio, Mo.

478,001.—Hot air furnace. John N. Frizzell, Brainerd, Minn.

478,005.—Violet dye. Robert Guehm and Jacob Schmid, Basle, Switzerland.

478,039.—Artificial fuel. Henry Zahn, Denver, Colo.

478,048.—Process of purifying water. Coles G. Collins, Kearney, N. J.

478,051.—Apparatus for coating tin plates. Albert T. Davies, Morriston, England.

478,066.—Washer for paper stock. Walter Moorhouse, Philadelphia, Pa.

478,067.—Method of manufacturing ammonium nitrate. Russell S. Penniman, Dover, N. J.

J. F. G.